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ABSTRACT

As poverty, dysfunctional families, and special needs continue to affect students, educators seek improved ways to start children in formal education. One such approach is to lower the teacher-to-pupil ratios, and recent research shows that this method positively influences pupil achievement. How the process works is not well understood. To fill this gap in knowledge, an examination of how teachers teach in these classrooms is provided in this report. The study describes life in a primary-grade classroom (with a low teacher-pupil ratio) in a fully Chapter 1-eligible school. Procedures for the research included interviews, structured classroom observations, informal classroom visitations, and the comparison of project school processes with research, other small-class settings, and "regular" or non-small settings. The focus was on first grade results, with comparisons offered for kindergarten and second grade. Findings show that comparisons of the pre- and post-observations of teachers indicated few observed changes in their behaviors following inservice activities. However, teachers in small classes demonstrated high levels of individualized instruction and minimal discipline problems. Factors such as space and materials facilitated instruction, and pretests and posttests indicated that students' performance in the small classes (n=14) were significantly better than those in the larger (n=23) classes. (RJM)

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ED 419 288

A STUDY OF REDUCED CLASS SIZE IN PRIMARY GRADES OF A FULLY CHAPTER 1-ELIGIBLE SCHOOL

Success Starts Small (SSS)

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Abstract

As students entering school are changing (e.g., due to poverty, dysfunctional families, special needs), educators seek improved ways to start them in the formal education system. Recent large-scale research (e.g., in Tennessee, Indiana and other places) has shown that low teacher-to-pupil ratios (e.g., 1:15) in early primary grades (K-3) positively influence pupil achievement. What has been missing have been analyses of how teachers teach in these classrooms.

This study sought to describe life in a low teacher-pupil ratio primary-grade classroom in a fully Chapter 1-eligible school. Procedures included interviews, structured classroom observations, informal classroom visitations, comparison of project school processes with a) research, b) other small-class settings, and 3) "regular" or non-small settings. The study focus was on grade one, with some comparisons also in kindergarten and grade two.

Teachers in small classes demonstrate high levels of task communications that are to individuals; transitions are smooth; discipline problems are minimal and handled individually. Space (crowding, noise) and materials facilitate the instruction. Based on ANCOVA (pretest is independent variable and posttest is dependent variable), student test performance in the small classes (n=14) is significantly ($p \leq 0.00$) better than in the larger (n=23) classes.

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First, the research team for the Success Starts Small (SSS) Project thanks the students, teachers, and administrators who helped make this project a success. Teachers allowed the researchers to observe and categorize the classroom communication events that make up "snapshots" of teacher-pupil classroom interactions.

Jean Owen, Ed.D., principal of the Oak Hill school, encouraged the development of the project and assisted with the planning steps. She served constantly as a cheerleader for the study. Spencer Gwynn, principal of the Peck School, saw the benefits of this study, supported the research team, and encouraged teachers at Peck School to participate in a project that offered little direct benefit to them. Personnel at the Guilford County Schools Central Office facilitated testing, test scoring, billing and payment procedures, and initially approved and supported the project. The support staffs (secretaries, other administrators, teacher assistants) provided support and help.

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Mostly, though, the research team appreciates the fine camaraderie and support offered by all persons the team contacted. Everyone encouraged the work of the project team and volunteered their support and services willingly – a spirit of inquiry and fun pervaded the entire project.

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Success Starts Small (SSS) Study:

Overview [1]

Introduction

The public, it seems, constantly wants more from its education system. From the late 1980s onward we have seen increasing criticisms of education and schemes – usually promulgated by non-educators – to try to "fix" education. Probably few educators would claim that the present system needs no improvement, but how many educators would recommend the externally imposed changes if they were asked what steps might be taken to improve schooling?

Children today are not like the children who came to schools when many of today's education processes were designed. Yet, schools today look much like schools of the past and, unfortunately, when educators attempt well researched changes, they often are told to "go back to the good old days," or "when I was in school," or "back to the basics," etc. To "remedy" the change in pupils entering schools, most schools are a hodge-podge of "add ons" in futile attempts to make the pupils of today "fit" into schools of yesterday rather than to design schools today to fit the pupils coming into them.

Although school violence, gangs, guns in schools, state "Report Cards" and federal "Wall Charts" may be the sensational stuff of media headlines, real issues for educators lie beyond the hyperbole symptoms and center on the pupils themselves. The shameful condition of many of America's youngest children – those who have no advocates, no votes and no money to pay to political action committees (PACs) – has been clearly documented (e.g., Hamburg, 1992; Hodgkinson, 1991, 1992; Reed & Sauter, 1990). Unfortunately, the data are real; unconscionably, some leaders pretend they are not. Proven ways to remediate the problems are often eschewed in moves to placate special interest groups wielding money and votes. Head Start languishes and even gets cut (Zigler, 1992) while some politicians vote for more police, prisons, politicians' pay and pensions. Yet, substantial research shows that there are steps that educators might use to improve educating today's children. Educators may be able to help solve many non-education

problems that children bring to school with them (poverty, abuse, sickness, fetal alcohol syndrome, emotional havoc), but other social institutions must accept their portions of the blame and contribute accordingly to solutions. (By the end of sixth grade, a typical pupil has spent less than 12% of his or her time in schools.)[2] In fairness, education should not receive a disproportionate part of the blame.

After observing the needs of children entering the Project School (school A), the faculty and staff determined to adjust the school to respond to student problems. As the school became fully Chapter 1 eligible, funds were deployed to provide class sizes in the early primary grades to allow teachers to work individually with the children -- more of a professional case-load method than an industrial assembly-line approach. The K-5 Project School had (1993-94) approximately 380 pupils with 78% free and reduced lunch and a race breakdown of 47% white and 53% black and other. The school houses some pre-K and special classes. Building upon teacher problem diagnosis and research results from class-size studies (Bain et al., 1993; Cahen et al., 1983; Finn & Achilles, 1990; Robinson, 1990; Slavin et al., 1990) and information about quality pre-school (e.g., Weikart, 1989) the faculty and administration chose to use Chapter 1 and other resources to reduce class size in K-2 to about a teacher-pupil ratio of 1:15 beginning in 1992-93; in 1991-92 the first-grades were 22-24 pupils. Pupils were randomly assigned to groups, and special education pupils were "mainstreamed." Teacher assistants would have primarily a non-academic and clerical/support role. By 1993-94 there were four classes each of K, 1 and 2 with an approximate 1:15 ratio.

A second school in the same system, closely matched on all variables except class size, served as a comparison (school B). The major focus for study was grade one but to understand the early primary (K-2) experience, researchers briefly reviewed the grades on each side of the target grade (i.e., K and 2).

The participating school system does not regularly test pupils on standardized tests until grade 3, so unless the researchers chose to do extra testing (they did not), the usual educational

outcome measures (test results) of success were not readily available. However, the central office and Chapter 1 persons agreed to test all grade 1 pupils in the two schools (Project and Comparison schools) twice during the 1993-94 school year. The researchers provided inservice instruction for the grade 1 teachers in the project school to help them explore better ways to teach in small classes. Part of the inservice activity was a visit to the Burke County, North Carolina schools which have been implementing 1:15 for several years in grades 1, 2 and 3.

Procedures

Researchers were interested in understanding what goes on (how teachers teach) in classes of approximately 15 pupils in grade 1. Researchers visited each school several times: observing, taking notes, interviewing (formal and informal), reviewing performance and records, and collecting and analyzing teacher and pupil interactions and communication patterns using a fairly uncomplicated observation process (French & Galloway, nd; Galloway, 1962).

Although results of formal teacher evaluations are on file and available, they typically provide little information about what actually occurs in the classrooms. The researchers used a modification of the French and Galloway (nd) PIT classroom interaction observation system where the observer divides classroom events or communications into: (P) or Personal; (I) or Institutional; (T) or Task; and (M) or Mixed. The communications can be to an individual (i) or to more than one (group) and designated as (g). Thus (Tg) is a Task event to the group; (Pi) is a Personal event to an individual.

Researchers entered a PIT notation approximately each 4-5 seconds or whenever there was a change in classroom communication events. Results were a pattern or flow of classroom activities within the rubric of the system used. Since activities in the K-2 setting were episodic and not as structured as a "typical" secondary subject-centered instructional time (a math class), the researchers observed formally (used the PIT process) for short "snapshots" of 5-10 minutes at several times rather than for extended "periods." Researchers took "snapshots" throughout the year to obtain data on teacher behaviors in classes of 1:15 (school A or Project School) and in

classes of 1:23 (school B or Control School). The snapshots were totaled for the early (pre) and later (post) observations in each grade level at each school.

Appendix A provides sample descriptors for PIT events (from French and Galloway, nd); Appendix B provides sample forms used to enter PIT observations and to tabulate results.

During 1992-93 teachers of small classes made notes about the experiences of working in the 1:15 setting, and teachers answered an "exit" interview. Their descriptions parallel the descriptions found in Project STAR (Word et al., 1990; Johnston et al., 1989) as provided by teachers in over 1000 exit interviews conducted from 1986-1990, and based on an analysis of the Teacher Problems Checklist or TPC (Cruickshank et al., 1980). Teachers of small classes (1:15) report more time, less confusion, better opportunities to work with individual pupils and to diagnose learning problems and establish remediation steps, etc. This result was also found in the 1992-93 "Project Success" analysis which preceded and provided support for the SSS effort (Appendix C).

Issues of Space

Interactions between pupils and teachers and among pupils are influenced by the environment and space in which the interactions occur. Although neither school in this study is new, there are space and environmental differences. In school A there is a feeling of spaciousness and openness; school B seems more confined. School A has some classes on the second floor and School B is all on one floor. School B is characterized by traditional classrooms, each about 23x23 feet, with a small area (cloakroom or clothes closet) that is also used for storage. Both grade-one rooms are located next to each other in school B; in school A the grade-one classrooms are not contiguous.

The restricted space in school B (approximately 530 square feet per classroom) adds to a feeling of crowdedness. The learning centers are crowded into corners; student desks are crowded to make some open room for small and large-group sessions. The contiguous rooms do not open one into the other, and any combining of classes for some instruction would not be easy.

These rooms have partial carpeting to provide defined space for students to work in small groups or for large groups to do work on the floor.

School A has an open feeling. Classrooms in school A are approximately 31 x 31 feet (961 square feet). Several classrooms adjoin, so that there can be immediate mobility between the spaces. There is room for learning centers to be clearly defined and for large and small groups to work simultaneously. No two rooms are arranged alike and toys and learning activities are always out and available. Indeed, the smaller groups of children do accent the ample space, but there is more space.

The differences in classroom size (961-529 or 432 square feet) are not only real, but also they add to the "tone" of the settings. School A classes have a calmness that just is not possible in the crowded conditions in school B. Another way to consider the issue is to say that in school A (average of 15 pupils/class) each pupil has about 64 square feet; in school B (average 23 pupils/class) each pupil has 23 square feet, nearly a 3 to 1 ratio of space difference.

Qualitative/Quantitative: A Combination of Data Sources and Uses

Quantitative data (e.g., numbers of pupils, amount of space, numbers of interactions, etc.) provide baselines for comparisons; analyses and interpretations of those data involve qualitative judgments. The "treatments" for teachers in school A included visits, work with a consultant, reading of information on small classes (e.g., from Project STAR), and other items that may have had some influence on teaching processes. Observations at both schools for grade 1 teachers were designated as pre and post, with time and directed inservice as a treatment for teachers in school A and time as the treatment for teachers in school B. For the pupils, the "treatment" in both schools was the class-size condition in which they spent their first-grade schooling.

Data Sources and Collection Times

Data for the study came from several sources. Those sources are shown below, along with the times that data were collected.

Data Source	Time to Collect Data: Pre	Post	Once
Observations	X	X	
Teacher Problems			X
Interviews			X
Student Test Scores	X	X	
Questionnaires			X
Context (space, demographics)			X
Demographics			X

Personnel and Procedures

The Principal Investigator worked with two experienced early-elementary teachers: the project associate was a doctoral student with about 10 years experience in grades K-1 and experience as an administrative intern trained in teacher observation; the project assistant had about 5 years experience as a K-1 teacher and concurrent with this project was serving an administrative internship in an elementary school. Both experienced teachers visited the schools and conducted observations. The project associate used part of the SSS study as the basis of her Ed.D. research.

The "treatment" for pupils was their year-long education experience in a class of approximately 1:15 (school A) or in a class of 1:23 (school B). The "treatment" for teachers in school A consisted of a) being part of the study (Halo or Hawthorne effect potential), b) visits to a school system using 1:15 for several years, c) reading about and discussion of benefits of 1:15 (e.g., Project STAR), d) visits to a school in Tennessee using innovative teaching strategies, e) work with a consultant (in Tennessee and in North Carolina) to help the teachers analyze their own teaching (reflective processes), and general involvement in a development process and research/inquiry (a strong staff-development process by itself, according to Sparks and Loucks-Horsley, 1989). One concluding event was a full-day visit by six school B teachers to school A to

observe the 1:15 processes as preparation for school B moving to a fully Chapter 1-eligible setting in 1994-95.

Basically, teachers in school B (the "control" setting) received no "treatment." They were, however, aware of the study, observed in their classrooms, and they completed the paper-and-pencil instruments for the study. The project focus was instruction in grade 1 in two conditions, 1:15 and 1:23. School A had four grade 1 teachers (1:15) and school B had 2 grade 1 teachers (1:23) and one split-grade (K-1) situation. (For most analyses, the K-1 combination was considered K; the grade 1 pupils were tested and used in test-score comparisons as grade 1 persons.) Classroom observations in both schools A and B included the target (grade 1) and some observations of grades K and 2 to establish continuity.

Classroom visits occurred throughout the year. To be considered "pre" the visits were completed by the end of January, 1994; "post" visits occurred mostly in May, 1994. Questionnaire data were also collected from grade 1 teachers in two 1:15 schools in Burke County, NC, where there are 1:15 classes in grades 1, 2 and 3. These schools were sites of visits by teachers from school A.

Potential Limiting Factors

The SSS Project began in October, 1993 and was completed in June, 1994. After the project began the cooperating local school system asked that pre and post testing be done for all grade 1 pupils in both schools. This was accomplished using the regular Chapter 1 procedure (the California Achievement Test or CAT) and expanding it to all pupils in grade 1 at both schools. Testing was done on 12/10/93 and 3/29/94, so a) the late pretesting would include some small-class treatment, and b) the early posttesting would shorten treatment time for pupils. Although the test-score comparison was not a part of the initial study plan, it was a welcome addition and provided a criterion measure understood by most people.

School B was on a regular calendar; some classes in school A were on a year-around schedule. In both schools there was pupil mobility so that not all pupils in a pretest were in a

posttest. Analyses used paired data for test-score comparisons. (Only pupils with both tests were used.)

The difficult weather of the winter of 1993-94 influenced both schools equally, disrupting some originally scheduled visits and testings and (perhaps) influencing attendance. Both schools had extended calendars for "snow days."

Context Information

Schools

The schools selected for this study were comparable in many ways, with the major difference being their organization for instruction. Of particular interest was that the Project School (A) organized for instruction with small classes in K, 1, and 2 (approximately 1:15) and the control school (B) organized with larger classes (approximately 1:23). School A is newer and the classrooms are larger than at school B. Although both schools are similar in race and socio-economic status (SES) factors, school A was fully Chapter 1-eligible in 1993-94 and in 1994-95 both schools were fully Chapter 1 eligible. Both are K (or pre-K) - 5, primarily "neighborhood" schools in the same school system. However, 1993-94 was the first year of a merger; previously the schools were in separate urban systems.

Each school has its own configuration of support personnel and special programs to assist in the education process. Both schools have Chapter 1 teachers' assistants, parent and volunteer programs, etc. School B has a program where local members of the Bar Association (lawyers) provide one-per-week reading sessions with some pupils and a Reading Discovery teacher is assigned to offer extra reading (tutorial) help to students in the lowest reading quartile. Generally, however, both schools consistently have ranked low in comparisons with other schools in the system on pupil test results -- probably a function of students entering school not as well prepared for the requirements of schooling as are pupils in other schools. Faculties in both schools must work creatively with those pupils who enter the school to get the best results possible.

The numbers of pupils in each school fluctuated some during the year; the date of count for the study was May 25, 1994. The numbers of pupils taking the pre and post tests are shown for grade one only (the only grade tested for this project).

Rater Agreements and Choice of What Observations to Use

Consistency in observations between and among raters is desirable for consistency and for replicability in observational research. To assure such believability, the researchers read the basic instructions for use of the PIT (French & Galloway, nd; see Appendix A). They conducted several pilot tests to refine their processes and to make adjustments in a form to collect the data. During the pilot tests and throughout observation sessions where more observers than one were present, the observers discussed the observations and their interpretations of those observations. A preliminary report based on early observations and the pilot test was prepared for presentation at the 1993 Southern Association of Colleges and Schools (SACS) meeting in Atlanta, Georgia (12/93) (Achilles, Kiser-Kling, & Owen, 1994). In the pilot study, 76% of teacher/pupil communications in small (1:14) classes in K-2 were Task, and 53% of the (T) events were to individuals; 20% of communications were Institutional with 72% of the (I) events to groups. Most Personal communications occurred in Kindergarten and all were individual; fewer than 5% of all communications were (P). See Table 1.

Table 1 about here

All observations were made by the three persons on the research team, usually in teams of two persons per observation. When two people made the same observations, they discussed their results after each session and arrived at agreement for the observation if there was any deviation. (Usually there was at least 95% agreement.) However, to provide some computation on the level or percent of agreement, the following procedure was followed. One person (the Principal Investigator) was designated as "expert" based upon his prior work in classroom

observation studies (e.g., Achilles & French, 1977). Each of the other investigators compared her ratings with the "Expert" over the same time frame of a classroom observation. The model was:

RATER A ◄——► EXPERT RATER ◄——► RATER B

A simple percent of agreement was computed between Expert and Rater A, and between Expert and Rater B. An agreement of at least 80% was acceptable for the research purposes of this study. The percents of agreement were based on several components of the PIT:

a. TOTAL communication events, including duration;

b. changes or shifts in events [e.g., from (P) to (T)];

c. direction of event (Individual or Group);

d. tallies of the type of event [(P), (I), (T), or Mixed].

Two separate observations were used of first-grade classes (different teachers) and the total of both teachers provided the basis for the tabulation of agreements between Rater A and the Expert Rater. For Rater B and Expert, only one set of observations provided the basis for percents of agreements. The tabulations appear in Table 2 based on a computation of agreement as: Expert - Rater ÷ Expert = % Agreement.

Table 2 about here

Most percents of agreements between Expert and Rater A and Rater B were between 93% and 100%. The largest differences were between the totals (duration), which result from slightly different perceptions of the 4-5 second interval for entering a record of an observation. There essentially were no disagreements on the changes in events, the direction (individual or group) or in the tallies of types of events. This similarity in observation results is a function of the simplicity of the PIT (low inference) and that the raters often worked as a team and then discussed their individual results before settling on a team result.

The final data decision was whose data collection (when two or more people observed together) to use in the reports. The decision was: use rater A whenever possible, use rater B whenever rater B and Expert coded the same events, and use Expert only when Expert observed classes without being accompanied by either (or both) of the other observers.

Analysis and Comparison Issues

The present study describes the teaching events (defined as teacher communications collected by the PIT observation instrument) in two different class conditions: 1) a teacher and about 15 pupils (1:15) and b) a teacher and about 23 pupils (1:23). One treatment was to provide inservice experiences to four 1:15 teachers throughout the year (as well as support for teaching supplies/materials and inservice library) to see if such work might influence their teaching to adapt better to 1:15. In addition, the participating school system agreed to provide test data (pre/post) for the first grades (the project paid the costs of scoring the extra tests). The major focus was grade 1, but in the target school (school A) the class sizes were reduced to approximately 1:15 in grades K-1-2. In the comparison school (school B) class sizes were approximately 1:23 in grades K-1-2.

Various data collection processes were used; some were fairly formal and standardized and some were quite informal and relied on subjective impressions (but in these cases the impressions are supported by examples or by interview or context information). The observations (PIT) were checked for inter-rater agreements and reported as percents. The test data were standardized and this project used only reading results as the surrogate for pupil learning gains. Context data came from floor plans, measurements, observations and reports provided by school personnel. Some teacher questionnaire information was obtained and compared not only between schools A and B, but also with information from Burke County (NC) schools where reduced class-size efforts have been locally supported since 1991 and to information from Tennessee's statewide class-size experiment, Project STAR. (For added

information see such sources as Finn and Achilles, 1990, Achilles et al., 1993, Word et al., 1990, and other references cited in these works.)

The Observational Data (PIT)

Since the durations of observations were not planned to be of equal time, nor were there equal numbers of communication events for the various groups, raw data (n) were converted to percents (%) for all comparisons. (Worksheets showing the data are in Appendix D.) For comparisons, data were grouped into the main categories of the observation instrument (T) or Task, (I) or Institutional, (P) or Personal and (M) or Mixed. Few (P) and (M) events were recorded. Data were aggregated into Individual (i) or Group(g). All (P) events were (i) and all (M) events were (g).

Context Data

The context data were collected early to establish the comparability of the schools (as shown in the proposal) and then at the end of May, 1994 to capture any changes that may have occurred during the project. The context data show similarities and differences that may help explain findings of the study. Notes recorded by observers on the PIT data-collection form and the informal, but informed, professional judgments (IPJ factor) of the researchers (two had a combined 15 years experience in teaching grades K and 1) constitute a source of subjective and informed information about the teaching and school aspects of the study.

Teacher Problems Checklist (TPC)

The teachers completed the TPC once. These data were "scored" and analyzed by grade and school. The TPC results were compared to results obtained in Tennessee's Project STAR (Word et al., 1990).

Grouping and Parental Involvement Questionnaires

These two questionnaires were adapted from Tennessee's Project STAR (Word et al., 1990). Results were tabulated and where open-ended responses occurred, these were subjected to categorization by content analysis.

Other Interview/Questionnaire Data

Participants provided other data that were tabulated and, if appropriate, subjected to categorization via content analysis. Results were compared, as appropriate, between schools or among grade levels and/or with other sites (e.g., Project STAR, TN, or Burke County, NC).

Standard Tests

Grade 1 pupils in both schools were tested twice on the California Achievement Test (CAT). The pretest was December 10, 1993; the posttest was March 29, 1994. Both testings were on the CAT II, Form E. Data were reported in Grade Equivalents (GE), Scale Scores (SS), National Percentile (NP), National Curve Equivalents (NCEs), etc.

Major Comparisons

Most comparisons in this study targeted the life in the small-class school, and especially in the grade 1 classrooms (n=4). The major comparisons are (as appropriate):

Grade 1 (School A) Pre	vs	Grade 1 (School A) Post
Grade 1 (School A) Pre	vs	K & 2 (School A) Pre
Grade 1 (School A) Post	vs	K & 2 (School A) Post
Grade 1 (School A) Pre	vs	Grade 1 (School B) Pre
Grade 1 (School A) Post	vs	Grade 1 (School B) Post
School A (Pre)	vs	School B (Pre)
School A (Pre)	vs	School A (Post)
School A (K & 2) Pre	vs	School B (K & 2) Pre

Response Rates

Project participation was voluntary. Typically there was 80-100% response by the teachers involved. Pupil test data were collected from all pupils attending a testing session, but analyses included pupils who had both pre and post testing. Approximately 90% of the pupils tested qualified.

Data and Analyses

Teacher Growth

A major component of the SSS effort was to help the four "target" teachers grow professionally and to focus on an understanding of their teaching and an analysis of the results of their teaching. Throughout the 1993-94 school year there were various "interventions" so the four teachers could observe, study, plan, discuss and reflect. We reviewed and summarized their performance as noted on North Carolina's standard teacher appraisal form, the TPAI; the pre and post observations on the PIT and the performances of the pupils in their classrooms all were indications of teacher growth. Reviews of brief personal narrative statements developed during the year with the help of an external consultant showed evidence of personal awareness of professional growth.

Background. Four teachers came to the small class-size project in 1992-93 and remained with the research project in 1993-94. Three teachers were first-year teachers; one teacher was a second-year teacher. Three hold bachelors' and one a master's degree. During the first year the teachers took 20 hours of staff development studying strategies for more active learning for six-year olds. This included thematic planning, whole language approaches, seminar discussions, using blocks, manipulatives, and computer-assisted learning. They visited small class-size rooms in another district. A most significant practice was their weekly, grade-level planning and sharing time. Through this, they became colleagues who supported each other, challenged their own premises and replanned as strategies worked and failed. They focused on finding ways to work with all children.

The second year of the small-class project and the year of the research effort, they continued the weekly planning. This year they worked from an agenda and an action plan. They occasionally joined in grade-level discussions with the kindergarten and second-grade teachers. Their staff development focused on conversations with a reading consultant, visits to the small-class project in two other districts and in another state, practice in reflective teaching, discussions with the researchers who were gathering data for the research project, and some presentations about their teaching. More of their conversations reflected on the results of their teaching as it related to the achievement of the students.

Teaching performance on TPAI. All teachers functioned in all eight areas at and above standard. Specifically and collectively, the teachers rated above standard in eight areas; well above standard in 17 areas.

Professional development plans. Their professional improvement plans were to develop portfolio assessments, increase self esteem through success in reading, develop strategies for restitution as opposed to punishment when pupils misbehave, and increase the development of oral language and reading among their pupils.

Personal narrative assessment. Their own assessment of the small class size included the following concepts attesting to their commitment to helping all students learn more.

The small-class condition allows me to...

-give more time to each child; hear each child read daily;.listen to each child talk daily; hold conversations with each child daily;

-give more time for indepth assignments, lessons and seminars;

-give more opportunity to study child and assess style, needs, interests, and achievements.

All of the group have experienced that the small-class condition assures that there are enough materials for each child to have what is needed to make learning occur. Being somewhat of a "select group" with the class-size project has encouraged the teachers to plan together and to share their successes and failures.

Summary of professional growth. These young, developing teachers, working with highly at-risk students, have in two years set a course of looking for ways to make all students successful learners. Discipline problems were minimal in spite of the high at-risk nature of their classes. "Can do" attitudes ranked high among most students, regardless of achievement levels.

Pupil Grouping

Teachers in school A (grades K, 1, 2) in school B (grade 1) and in Burke County (grade 1, n=9) responded to the teacher grouping questionnaire. Results appear in Tables in Appendix D (pages D-4 to D-9). Results in SSS are similar to results of other studies. In K there is little formal grouping. Much instruction is individual, and a major focus is reading readiness and developmental activity.

Grade 1 (school A, school B, and Burke Co.) practices seem quite consistent regardless of class size. (Pupil n is reported for each teacher on the Tables.) Nearly every grade 1 teacher (13 of 15) reported grouping for reading instruction, and using from 3-5 groups but varying these as needed. This practice is true in classes of 14 as well as in classes of 23. Pupils are assigned based on a mix of ability and interest, and the amount of time per week in groups varies by teacher from 30 to 300 minutes.

For math, there is less uniformity in pupil grouping with 7 of 15 teachers reporting the use of from 2-7 groups. Essentially science and social studies are taught in whole-group processes with only 4 of 15 teachers reporting any specific grouping practices. In the small classes, the added space and materials per child allowed a calmer approach with centers and themes (webs) readily apparent.

The difference in class sizes (1:15 or so and 1:23) does not seem to be a major factor in the use of groups. However, space and the number of pupils per group (three groups in a class of 15 will average 5 pupils; in a class of 23, three groups will average nearly 8 pupils) are likely to influence the amount of individual instruction and teacher/pupil engaged time for learning.

Parent/Volunteer Contact

The parent/volunteer questionnaire asked teachers to respond based on their last four weeks. The questionnaire was given to all teachers to complete at approximately the same time (within the same week). Some wrote notes that they had done many of the things mentioned, but not within the last four weeks (e.g., some had made home visits at the beginning of the school year, but not within the last four weeks). However, all teachers were under the same data-collection rules.

Note that in K (school A) and grade 1 (school B) there were full-time teacher assistants in classrooms; in grades 1 (school A and Burke Co.) and 2 (school A) teacher assistants were part-time; that is, in the lower-teacher-pupil ratios the teacher assistants were shared, used mostly to assist (clerical and supervision of such things as lunch) and to monitor small groups while the teacher worked with others.

Major areas of difference for 1:15 (note that Burke Co. was 1:15 in grade 1), with the 1:15 registering considerably more of the involvement or contact, were total home visits and communication via newsletters home. Teachers of all groups used written notes home, both individualized and as a form letter. Some teachers in 1:15 sent at least one letter per pupil per week home. The amount of help from a teacher assistant was clearly a function of full-time vs part-time, not of class size (no surprise here).

Student Discipline and Behavior

School A had an assistant principal who handled major discipline cases and kept extensive pupil behavior notes. Table 3 shows the numbers of discipline referrals handled by the assistant principal, 1991-92 to 1993-94 by grade. In 1992-93 the school moved to the 1:15 format in kindergarten and grade 1 and from 1991-92 to 1993-94 the discipline referrals in grade one declined from 38 to 28 to 14. Table 3 reports referrals from the teacher to the office; either there were fewer absolute problems or teachers were handling more situations in the classrooms.

Table 3 about here

Teacher Problem Checklist (TPC) Data

TPC Results and Discussion

The Teacher Problems Checklist (Cruickshank et al., 1980) is designed to ask teachers about five problem areas (time issues, pupil control, parent relations, student success, affiliation) on two dimensions: a) how frequently is this a problem? and b) when it does happen, how bothersome is it? As with all data collection in the SSS study, teacher participation and response were voluntary. The response rates for TPC (fully usable responses) are:

	Grade Levels of Respondents		
School	Grade 1	Other	Total
1 (A)	4	7	11
2 (B)	2	2	4
3	8	--	8
4	9	--	9
Totals	23	9	32

The small number of respondents, especially in the two schools (Project and Control) of primary interest in this study, precludes any detailed analyses of TPC responses. Rather, responses should be viewed descriptively and reviewed for trends. In considering the generalizations, note that a) all classes in School 1 (A) in grades K-2 were quite small (1:12 - 1:18), with grade-1 classes about 1:15; b) in schools 3 and 4 only grade-1 teachers (n=17) responded and classes were about 1:16 and had been that size since 1991; c) only two grade-1 teachers in school 2 (B) had large (1:24) classes; and 3) in Project STAR with some 1000 respondents (over 300 in small classes) there were no significant differences among teacher groups (small class, regular or 1:25 class, or regular class with full-time assistant) except on the Time cluster of items (Word et al., 1990).

Of the five problem areas and two dimensions (total of 10 categories) the grade-1 teachers (overwhelmingly small classes, 27 to 2) found 9 to be less of an issue than did the teachers in K and grade 2; the one category that differed was bothersomeness of "control" and this was less than 0.1 difference.

The analysis of "bothersomeness" of the problems by school (1, 2 and 3 & 4) shows that in all five problem categories the teachers in the small-class schools (1, 3 & 4) list the problems as less bothersome than do the teachers in the control (1:23) school. Essentially, results on the TPC show that the problems occur less frequently and are less bothersome in grade 1 (mostly small classes), and also mostly in school 1 (A) where most K-2 classes were small.

Teacher Observation Data

The teacher observation data were collected during classroom observations by project researchers and constitute a major source of the information about "life in the 1:15 classroom." Data were reduced from the forms used to collect the PIT information (see Appendix B) and changed to percents for use in discussions. Data worksheets are in Appendix D, pages D-1 through D-3. "Pre" observations were done in the late fall, 1993; post observations were done in May, 1994.

Following the general PIT instructions (see Appendix A), researchers analyzed total communication events and the changes [e.g., from (P) to (T), or from (T) to (I)] in communication events to individuals (i) or to groups (g).

Table 4 provides the details of communication cues (totals) by PIT and (i)/(g) both within category [e.g., (Ti) and (Tg)] and across categories [(P)+(I)+(T)]. Table 5 provides the same information for changes in communications or shifts from (T) to (I), (P) to (T), etc. Table 5 shows that of all pre-observation communication 51% of School A, grade 1 communications were (Ti) but only 31% of School B, grade 1 communications were (Ti). For I (the category) 59% of School A, grade 1 were (Ii) and 38% of School B, grade 1 communications were (Ii). The complement (Ig) shows that 62% of School B, grade 1 (pre) communications were to the group (correcting class

behavior, for example) and only 41% of School A, grade 1 (T) communications were to the group; corrective behavior and "playing school" directions were more personal or individual in School A than in School B. This low-key approach surely influenced the general impression of quiet order in the 1:15 rooms where there seemed to be little need for the teacher to address the entire class about behavior or routine.

Tables 4 and 5 about here

Table 5, especially in terms of category subtotals, shows that there was considerable consistency (pre/post and school A/school B and grade 1/grades K and 2) in the changes in communication cues. What differences there were paralleled the differences in percents of subtotals shown in Table 4.

Tables 6 and 7 show that researchers recorded 7195 total communication events and 1394 communication event changes. Table 6 shows the distribution of total communications by schools (A or B), by grade (K-2, if appropriate) and at pre and post times. Total events in schools A and B were quite similar in terms of distribution to individuals and to groups, with the ratio at 55/45 for school A and 50/50 for school B. Yet, internal analyses show that in the 1:15 school, both grade 1 and grades K and 2, the communications to individuals were more prevalent at pre than at post and that by the post observation there was more balance between communications to individuals and to groups (going from 63/37 to 47/53). At pre observation, grade 1 (school A) communication was 61% individual and in grade 1 (school B) communication was 39% individual. At post observation, A had decreased individual and B had increased individual, so both A (51%) and B (49%) were very alike in the division of communications to individuals.

The picture of individual cues shows early one-on-one work in 1:15 with a transition to more group work by the later observations. The 1:23 condition shows the opposite pattern, beginning with less individual and more group communications. Fairly consistently throughout

the study and in all observations, about 1% of communications were categorized as (Pi). In no case was there in excess of .5 percent of (Mg) communications, and those few were always group.

The "heart of the matter" is on-task work in classrooms. This typically shows in the PIT system as task (T) and in the balance between individual and group communications. Table 6 shows a pre/post consistency for grade 1 teachers in School A (82%/84%) for pre/post (T) communications. Note that in the pilot test (Attachment A) the (T) communications were 76% of all communications in the small classes. The pilot plus the regular study confirm the high level of on-task activity in the small classes. By post observation the other 1:15 classes (school A, grades K and 2) had moved from 66% to 89% (T) communication, so that total (school A) for (T) went from 77% (pre) to 87% post, showing a strong pattern of on-task work. In the 1:23 condition, (T) communications were about 10% less than in school A and, in fact, (T) communications in school B, grade 1 decreased pre to post nearly 12% (from 79% to 67%) while the (I) or "playing school" communications increased. Researchers could sense this increasing need for control and for keeping pupils orderly in the 1:23 classes as the end of the school year approached. In the 1:15 conditions, things were still calm at the end of the school year, with total (I) cues going from 22% to 13% as (T) increased with a slight shift from individual to group activities. (One got the "feeling" that the 1:15 groups were just -- at the end of the study -- getting to their peak learning modes and that if the study were longer and the post assessment later, the school A group would show up better than it did.) Of particular note for this study is the consistency in school A, grade 1, of (T) communication at about 83% and (I) communication at about 16% of the time.

Table 7 shows event changes [(P) to (T) or (T) to (I), etc.]. There are no abrupt surprises and the changes are similar to totals shown in Table 6.

Tables 6 and 7 about here

The composite, essentially provided by a review of data in Tables 4 and 6, is of consistently more "on taskness" in school A as shown by percent of (T) behaviors compared to (P) and (I) in the same school, or as compared to (T) behaviors in the comparison school. For grade 1 teachers (in school A) this pattern remained consistent (pre/post) with some shift in emphasis between (i) and (g) from highly (i) at pre (61% of all communication) to a balance (51%/49%)at the time of post observations.

Perhaps of most importance in the present study is the finding that in general in the 1:15 classes (school A, total, grades K-2) 81% of a pupil's time is spent with teachers using (T) communications, usually to the individual. In the 1:23 classes (School B, total, grades K-2) 71% of a pupil's time is spent with teachers using (T) communications evenly distributed (50/50) to individuals and to groups. Although the difference between 81% and 71% (10%) is obvious and important – especially as it will last the entire year – a second but less obvious difference adds to the impact of the "obvious" 10%. Using the class-size averages (1:15 and 1:23) a pupil in a 1:23 class averages only 65% of the teacher attention that is available to a pupil in a class of 1:15 (15÷23=.652). This difference is influential in comments of 1:15 teachers who say:

> Small classes let me treat the students as family.
>
> With only 15 pupils, I can identify and work to remediate learning problems.
>
> The small class means that we have plenty of space and materials for everyone.
>
> With a small class I get to know each pupil and his problems.
>
> Having 15 pupils lets me plan an individual activity for each pupil almost every day.
>
> If a pupil in a small class has a problem, I have time to get back to the pupil.
>
> Fewer pupils mean fewer groups, so I can monitor the groups and this has two benefits – less off-task behavior and fewer "worksheets" or busy work for one group while I work with another.

The researchers were able to observe classroom behaviors that corroborated these teacher open-ended comments about the small-class condition. Teacher observed behaviors favor 1:15 in

favor 1:15 in the distribution of on-task teacher communications (T), and more communications are to individuals than to groups.

Student Test Results

At the request of school personnel, pupils at both schools took a pre and post administration of the California Achievement Test (CAT) level II, Form E (1985 norms). Due to a late start for the project, the pretest was given December 10-12, 1993, and the posttest on March 29, 1994, or only about 3.5 months apart. Tests were scored through the Guilford County Schools, and the pre and post results were provided to the researchers. (Scores provided were NCE, national percentile, grade equivalent, and scale score.) Scores were aggregated by teacher (school A had 4 teachers with small classes of about 14 pupils; school B had 2 teachers with "regular" classes of about 23 pupils and one teacher with a K-1 split with 10 first graders).

Between pre and post, there was some pupil mobility, so for any pre-post analyses only the scores of pupils who were present for both testings were used, except for the teacher and school comparisons on NCE when all pre and all post scores were used. In schools A and B there were fewer than 10 pupils who either did not take a pre or post test, or who had moved in or out of the classrooms being studied between December, 1993 and April 1994.

Although researchers attempted to "balance" the schools on key demographics (race, SES, percent Chapter 1, etc.), the pretests showed that pupils in school B were ahead academically (on items measured by the CAT Total Reading) of pupils in school A at pretest time with a grade 1 average NCE of 14.3 to 26.4. (See Table 8.) They retained their advantage at the posttest (28.6 to 35.1 NCEs). (Table 8 is based on NCE data and is used here descriptively.) School A's mean NCE on CAT Total Reading moved up 14.3 points and school B's mean NCE moved up 8.7. The advantage that school B had at pretest (11.9 NCE) had been reduced to 6.5 NCE by posttest, but school A had further to go from pretest (14.3 compared to 26.4). The low average NCEs at both schools show the difficulty of the educational task to try to get these pupil populations to "average" on standardized tests.

Using only school A data, researchers computed the grade equivalency (months) gain between pre and post testing. There was a total of 3.5 months between the two tests, including the December holidays and an unusual number of "snow days" during the winter of 1994. Average grade equivalency gain by teacher in school A between pre and post was: 5.9, 4.3, 5.5, and 4.7, with a grade one average of 5.1 in a 3.5 month time. Of the 56 matched pre-post pupils, 6 (11%) failed to achieve at least one NCE. (Average grade equivalency information was not developed into a table.)

Table 8 about here

There were four grade 1 teachers in school A and three in school B (one of whom taught a K-1 split grade). In school B there were 103 grade-1 pupils who had complete pre and post data sets, and 93 pupils not in the K-1 split. Analyses ideally would use only the class averages (n=4 for school A and n=2 for school B). This analysis was run, but the low n was a problem. The Analysis of Covariance (ANCOVA) was also employed using pupils in each school, and again for pupils in each school minus the pupils in the K-1 split. The pupil scale scores were used and ANCOVA applied due to the greater achievement levels in school B at pretest time on the CAT. In the ANCOVA model, pretest data were the independent variable and posttest data were the dependent variable.

Data for the ANOVA and ANCOVA analyses appear in Appendix E, pages E-1 to E-6. Pages E-1 to E-3 show the pretest and the posttest comparisons on scale scores (one-factor ANOVA); pages E-4 to E-6 show the ANCOVA analyses. Pages E-7 to E-11 contain added analysis details. The data on pupil n by teacher for pre and for post and for both pre/post are shown on Table 8.

Table 9 shows the summary data for ANOVA and ANCOVA analyses, including the mean scores (standard deviations, etc. are on pages E-4 to E-9, Appendix E). Pupils in school A started with significantly lower scores (305.64 to 385.04; $p \leq .003$) than pupils in school B and

also ended that way (358.04 to 448.89; $p \leq .042$) but as a group pupils in school A had a mean score gain greater (11.3) than did pupils in school B. This difference translated into an ANCOVA of .000 favoring school A using the pupil as the unit of analysis for both 103 pupils and for 93 pupils (removing the n=10 pupils who were in school B in the K-1 split grade). The ANCOVA difference using the class as a nested variable (n=6 and n=7) in the analyses was still $p \leq .000$ favoring school A.

Table 9 about here

Given the substantial "head start" of pupils in school B over pupils in school A [average of 12.1 NCE (Table 8) and average difference of 52.4 scale score points (Table 9)], the expectation is that pupils in school B will maintain and add to this advantage as they go through school unless there is a substantial intervention. School B did have the regular Chapter 1 interventions, a full-time teacher aide, and a Reading Discovery teacher to work with pupils in the lowest reading quartile. School A employed as its major intervention reduced class size (x = 14); there were not full-time instructional aides in each classroom or special Reading Discovery efforts in school A.

School A pupils as a group and in each class reduced the pretest gap considerably during the 3.5 months between pre and posttesting. Based on pupils' test performance, the small-class intervention seems highly effective.

Discussion

This project had several objectives; one related to continuing inservice and teacher change of teaching behaviors. The inservice "treatment" was varied. For the four grade-one teachers of 1:15 in school A, there were such activities as reading on class-size effects, preparation of materials and presentation at professional meeting, visits to schools with 1:15 classes, work with a consultant on reflection and on improved teaching, collection and analysis of pupil test

data, development of brief narrative statements, and eight months of nearly continuous involvement in a research and development project (the present study).

Essentially, based on the comparisons of the pre and post observations, there were few observed changes in teacher behaviors after the inservice activities. While data reported do not provide exact indications why there was little change, there is room for some speculation. The four "experimental group" teachers all were quite new to teaching (three were second-year teachers and one had about three years of experience), and all had taught in 1992-93 in small-class situations. Thus, they really did not have much large-class experience. All four communicated regularly, planned together, and together had visited other 1:15 sites.

The professional growth of the grade-1 teachers (as shown by their narratives, their pupil growth and the TPAI assessments of their principal) did not necessarily translate into changed classroom behaviors as shown by changes in observations of teaching. Further, since there were no predetermined changes or goals at which the inservice effort was directed (there has been little research on "good" or "effective" teaching behavior in small classes), it is possible that the inservice activities only strengthened the skills learned and used in the 1:15 situations in 1992-93.

Change did occur in school A (the project school) in the teaching behaviors of the second-grade teachers from the first to the second observation. This group had "regular" (1:25) classroom experience and at the beginning of 1993-94 began small (1:17) classes with many of the pupils who had small classes in 1992-93. Did the smaller classes influence these teachers to change during the year and begin to teach more like the teachers with experience in 1:15? Note that the PIT and (i) and (g) behaviors of grade-2 teachers became more like the behaviors of the grade-1 (1:15) teachers between the pre and post observations. (See Tables 4 and 6.)

A second objective of the project was to study and describe "Life in a Small Class" from a variety of perspectives. Appendix C provides one summary of the 1:15 experience from the teacher perspective. Throughout the study report are other comments: spaciousness, more individual attention, a sense of calm purpose, reducing discipline problems, a sense of family.

Especially in school A the students entered grade 1 as poor academic performers on standardized tests (the CAT, total reading average NCE for school A, grade 1 was only 14). This group of pupils not only presents great challenges in teaching and learning, but the group also brings many problems to the school setting. The individual attention, random assignment and the individualized, on-task teaching behaviors (note the observational data) are important both for pupil growth and for a teacher's sense of efficacy.

Pupils in the small class get a better "deal" in terms of individual attention and in terms of on-task teacher behavior than do pupils in the regular (1:23) condition. This translates into a view of life in the 1:15 classroom that is consistent with the folk wisdom -- it is calmer, more attentive, and more learner centered. This "affect" translates into substantial pupil academic growth. For today's children -- and based on such research as STAR -- the good early start is important. [Note that one STAR finding (e.g., Nye et al., 1994) is that small classes are facilitative and preventive; they do not help much as remediation after a pupil has not had a good start in schooling.]

Based on the aggregate data (observations, questionnaires, student tests, discipline, etc.) the results are clear in supporting smaller classes as a means to work with at-risk early primary pupils. Inservice activity for the 1:15 teachers was not followed by much change in teacher/pupil classroom behaviors, but this may not be surprising as the preobservation behaviors of these teachers were highly task oriented and individualized. Small classes (n=14) are a positive process for pupil growth in early elementary grades and seem to have wide-scale results (that is, reading tutorial work should help reading scores, but might not help science or pupil behavior, etc.) that transcend the usual and simplistic aspect of test-score gains. Results of this study are very similar to results from Project STAR in Tennessee, and to preliminary results of the evaluation of the Burke County (NC) class-size initiative (in press).

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Notes

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[2]The math is fairly easy. Each year of schooling is about 180 days, with about 7 hours/day or 1260 hours. A pupil completing grade 6 (include K) has 7x1260 or 8820 hours of schooling. A pupil completing grade 6 (with no retentions and entering K at age 5) is 12 years old. A year has 365x24 or 8760 hours (excluding leap years). So: 8760 x 12 + 8820 is the basis. That is 105,120 + 8820 or 11.9%. The computation is probably conservative.

Table 1

Distribution of pilot test PIT communication events to Group (g) or Individuals (i) for K,1,2 classes (ave 1:16 ratio), SSS Study, 1993 (numbers).

Numbers

	TASK			INSTIT.			PERS			MIX	TOTAL
GRADE	g	i	TOT	g	i	TOT	g	i	TOT	TOT	
K	62	114	176	22	18	40	0	9	9	0	225
1	65	73	138	21	5	26	0	4	4	9	177
2	50	16	66	29	6	35	0	0	0	0	101
TOT	177	203	380	72	29	101	0	13	13	9	503

Percents

GRADE	g	i	TOT	g	i	TOT	g	i	TOT	TOT	Row	Col
K row	28	51	78	10	8	18	0	4	4	0	100	
Event	35	65	100	55	45	100	0	100	100	0		45
1 row	37	41	78	12	3	15	0	2	2	5	100	
Event	47	53	100	81	19	100	0	100	100	100		35
2 row	50	16	66	29	6	34	0	0	0	0	100	
Event	76	24	100	83	17	100	0	0	0	0		20
TOT row	35	41	76	14	6	20	0	3	3	2	101*	
Event	47	53	100	72	29	101*	0	100	100	100		100

*Total may not equal 100% due to rounding.

Table 2

Computations of Percents of Rater Agreements, SSS Study, 1993-94

	A			Expert			Computations 1		2		TOT	
	1	2	TOT	1	2	TOT	DIF	%	DIF	%	DIF	%
TOT Events	45	33	78	42	31	73	3	93	2	94	5	93
Changes	16	12	28	17	12	29	1	94	0	100	1	97
Group	9	6	15	10	6	16	1	90	0	100	1	94
Indiv.	7	6	13	7	6	13	0	100	0	100	0	100
P	1	0	1	1	0	1	0	100	0	100	1	100
I	6	0	6	5	0	5	1	80	0	100	1	80
T	38	33	71	36	31	67	2	94	2	93	4	94

	B	Expert	Computations	
	TOT	TOT	DIF	%
TOT Events	125	121	4	97
Changes	14	15	1	93
Group	36	37	1	97
Indiv.	89	84	5	94
P	1	1	0	100
I	0	0	0	100
T	13	14	1	93

Table 3

Written Discipline Referrals Handled by Assistant Principal, 1991-92 through 1993-94, Oak Hill School

	Disrespectful	Refuse to Do Work	Disrupt	Hitting Fighting	Threats	Stealing	Weapon*	Drug Possession	Total
1991-92									
Grade 1	6	9	8	12	0	3	0	0	38**
1992-93									
Kindergarten	1	0	0	0	0	0	0	0	1
Grade 1	5	6	7	9	1	0	0	0	28**
Grade 2	13	8	10	16	2	4	0	0	53
Grade 3	8	5	6	11	0	0	0	0	30
Total	27	19	23	36	3	4	0	0	112
1993-94									
Kindergarten	2	0	1	2	0	4	0	0	9
Grade 1	2	1	1	7	1	0	2	0	14**
Grade 2	18	17	12	47	6	3	2	1	106
Grade 3	12	12	8	20	9	2	1	0	64
Total	34	30	22	76	16	9	5	1	193

*New NC law in 1993-94 required reporting of any weapon.

**Reduction from beginning (1991-92) to this project was from 38 to 14, in grade 1. This number for grade 1 is down in spite of a general growth trend in reported discipline over the time shown.

Table 4. Percents of Pre and Post Communication Events (TOTALS) Compared by Schools A and B, Grades K-2.

Totals	T_i		T_g		Sub. T		I_i		I_g		Sub I		P_i		M		Total (n)	
Grades	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
K																		
A %CAT	77	59	23	41	100	100	52	73	48	27	100	100	100	100	100	100	100	100
%TOT	59	54	17	38	76	92	11	5	10	2	22	7	2	1	0	0	100	100
B %CAT	61	–	39	–	100	–	59	–	41	–	100	–	100	100	100	–	100	–
%TOT	43	–	28	–	70	–	17	–	12	–	30	–	*	–	0	–	100	–
A-B CAT	16		-16		–		-7		7		–		–	–	–	–	N/A	
A-B TOT	16		-11		6		-6		-2		-8		1	1	–	–		
Grade 1																		
A %CAT	62	52	38	48	100	100	59	44	41	56	100	100	100	100	100	100	100	100
%TOT	51	44	31	40	82	84	10	7	7	9	17	15	1	1	0	0	100	100
B %CAT	39	50	61	50	100	100	38	49	62	51	100	100	100	100	100	100	100	100
%TOT	31	33	48	34	79	67	8	15	13	16	21	31	*	*	0	0	100	100
A-B CAT	23	2	-23	-2	–	–	21	-5	-21	5	–	–	–	–	–	–		
A-B TOT	20	11	-17	6	3	17	2	-8	-6	-7	-4	-16	*	*	–	–	N/A	
Grade 2'																		
A %CAT	55	18	45	82	100	100	66	37	33	63	99+	100	100	100	100	100	100	100
%TOT	34	16	27	70	61	86	25	5	13	9	38	14	1	0	0	0	100	100
B %CAT	70	–	30	–	100	–	33	–	67	–	100	–	100	100	100	–	100	–
%TOT	47	–	20	–	67	–	11	–	21	–	32	–	*	–	0	–	100	–
A-B CAT	-15		15		–		33		-34		–		–	–	–	–		
A-B TOT	-13		7		-6		13		-8		6		*	–	–	–	N/A	
TOTAL																		
A %CAT	62	47	38	53	100	100	61	47	39	53	100	100	100	100	100	100	100	100
%TOT	48	41	29	46	77	87	14	6	9	7	22	13	1	1	0	0	100	101
B %CAT	53	50	47	50	100	100	41	49	59	51	100	100	100	100	100	100	100	100
%TOT	39	33	34	34	73	67	11	15	16	16	27	31	*	*	0	0	100	100
A-B CAT	9	-3	9	3	–	–	20	-2	-20	2	–	–	–	–	–	–		
A-B TOT	9	8	-5	12	4	20	3	-9	-7	-9	-5	-18	*	*	–	–	N/A	

* = less than 1 percent. Totals not equal to 100% are due to rounding.
%CAT = percent of each category, e.g., of T_i or of T_g.
CAT = Category

Table 5. Percents of Pre and Post Communication Events (CHANGES) compared by Schools A and B, Grades K-2.

Changes / Grades	T_j Pre	T_j Post	T_g Pre	T_g Post	Sub T Pre	Sub T Post	I_j Pre	I_j Post	I_g Pre	I_g Post	Sub I Pre	Sub I Post	P_j Pre	P_j Post	M Pre	M Post	Total (n) Pre	Total (n) Post
K																		
A %CAT	66	54	34	46	100	100	35	62	65	38	100	100	100	100	100	100	100	100
%TOT	43	39	22	33	65	71	11	16	20	10	31	25	4	4	0	0	100	100
B %CAT	62	--	38	--	100	--	65	--	35	--	100	--	100	100	100	100	100	--
%TOT	29	--	18	--	47	--	33	--	18	--	51	--	1	--	0	--	99	--
A-B CAT	4		-4		--		-30		30		--		--		--	--		
A-B TOT	14		4		18		-22		2		-20		3		--	--	N/A	
Grade 1																		
A %CAT	58	43	42	57	100	100	61	50	39	50	100	100	100	100	100	100	100	100
%TOT	31	25	23	33	54	59	25	20	16	20	41	40	4	2	*	0	99*	101
B %CAT	56	52	44	48	100	100	62	60	38	40	100	100	100	100	100	100	100	100
%TOT	33	34	26	31	60	66	24	19	15	13	39	32	1	2	*	*	100+	100+
A-B CAT	2	-9	-2	9	--	--	-1	-10	1	10	--	--	--	--	--	--		
A-B TOT	-2	-9	-3	2	-6	-7	-1	1	1	7	2	8	3	0	*	*	N/A	
Grade 2																		
A %CAT	49	37	51	63	100	100	69	69	31	31	100	100	100	100	100	100	100	100
%TOT	23	25	24	42	47	67	34	21	15	11	50	32	2	1	2	0	101	100
B %CAT	53	--	47	--	100	--	53	--	47	--	100	--	100	100	100	--	100	--
%TOT	29	--	26	--	55	--	23	--	20	--	42	--	3	--	0	--	100	--
A-B CAT	-4		4		--		16		-16		--		--		--			
A-B TOT	6		-2		-8		11		-5		8		-1		2		N/A	
TOTAL																		
A %CAT	58	44	42	56	100	100	59	56	41	44	100	100	100	100	100	100	100	100
%TOT	32	28	23	36	55	64	24	19	17	15	41	34	3	2	1	0	100	100
B %CAT	56	52	44	48	100	100	59	60	41	40	100	100	100	100	100	100	100	100
%TOT	31	34	25	31	56	66	25	19	17	12	43	32	2	2	0	*	101	100+
A-B CAT	2	-8	-2	8	--	--	0	-4	0	4	--	--	--	--	--	--		
A-B TOT	1	-6	-2	5	-1	-2	-1	0	0	3	-2	2	1	0	--	*	N/A	

* = less than 1 percent. Totals not equal to 100% are due to rounding.
CAT=Category. %CAT=Percent of each category, e.g., of T_j or of T_g.

Table 6

Percents of Total Communication Events (P.I.T. by Individual or Group) for Schools and Grades, SSS, 1994

	Total (n) Events	EVENTS (%)* T	I	P	M	In	Gp
Grade 1 (A)	2732						
Pre	1508	82	17	1		61	38
Post	1224	84	15	1		51	49
Grades K&2 (A)	2069						
Pre	885	66	33	1		64	36
Post	1184	89	10	1		43	57
Grade 1 (B)	1560						
Pre	672	79	21	*		39	61
Post	888	67	31	1		49	50
Grades K&2 (B)							
Pre	834	68	31	*		59	41
--							
Grades							
K-3 (Pre) A	2393	77	22	1		63	37
(Pre) B	1506	73	27	*		50	50
Diff (A-B)		4	-5	1		13	-13
K-3 (Post) A	2408	87	13	*		47	53
K-3 (Post) B	888	67	31	1		49	50
Total Events (A)	4801	81	18	1		55	45
Total Events (B)	2394	71	28	1		50	50
A (K-3) Pre	(2393)						
A (K-3) Post	(2408)						
B (K-3) Pre	(1506)						
B (1) Post	(888)						

Grand Total 7195 Communication Event Totals

*=less than 1%. Totals not equal to 100% are due to rounding. Details of computations are on Tables F-1 to F-3.

Table 7

Percents of Communication Event Changes (P.I.T. by Individual and Group) for Schools and Grades, SSS, 1994

	Total (n) Changes	CHANGES (%)*					
		T	I	P	M	In	Gp
Grade 1 (A)							
Pre	175	54	41	4	*	60	40
Post	177	59	40	2		47	53
Grades K&2 (A)							
Pre	293	55	41	3	1	59	41
Post	180	69	29	2	0	51	49
Grade 1 (B)							
Pre	174	60	39	1	*	58	42
Post	166	66	32	2	*	55	46
Grades K&2 (B)							
Pre	229	52	45	2	0	57	42
--	--	--	--	--	--	--	--
Grades K-3							
Pre A	468	55	41	3	1	59	41
Pre B	403	56	43	2	0	58	42
Diff A-B		-1	-2	1	1	1	-1

Total Changes (A)	825
Total Changes (B)	569
A (K-3) Pre	468
A (K-3) Post	357
B (K-3) Pre	403
B (1) Post	166
Grand Total	1394 Communication Event Changes

* = less than 1%. Totals not equal to 100% are due to rounding. Details of computations are on Tables D-1 to D-3.

Table 8

Pre and Post Mean NCE Results for Schools A and B, by Teachers, on CAT Total Reading, SSS Project, 1994

	Mean (x) NCE		Mean	Students in Both
	Pretest (n)	Posttest (n)	NCE Gain	Tests (n)
School A	14.3 (63)	28.6 (61)	14.3	56
Teacher 1	7.8 (16)	30.8 (16)	23.0	14
2	27.2 (15)	36.1 (15)	8.9	12
3	7.1 (16)	21.0 (16)	13.9	16
4	15.7 (16)	26.9 (14)	11.2	14
School B	26.4 (53)	35.1 (51)	8.7	47
Teacher 1*	33.6 (10)	40.6 (10)	7.0	10
2	25.5 (21)	28.1 (22)	2.6	18
3	24.0 (21)	39.7 (20)	15.7	19

*This was a K-1 split grade.

Table 9

Summary of One-Factor ANOVA and ANCOVA Using Total Pupils (n=103) and also (ANCOVA) pupils n=93 (removing K-1 split grade)

ANOVA		Mean Scores		
	n	Pre	Post	x Gain
A	56	305.64	407.79	102.15
B	47	358.04	448.89	90.85
Total	103			
Difference		52.4	41.10	11.30

By Student Analysis (n=103 students)

Pretest Dfiference (A vs B)	$p \leq .003$	Df 102 (1, 101)
Postest Difference (A vs B)	$p \leq .042$	

By Teacher Analysis (n=7 teachers)

Pretest	$p \leq .016$	Df 102 (6, 96)
Posttest	$p \leq .139$	

ANCOVA

Pupil n=103	$p \leq .000$	Df 102 (1, 1, 1, 99)
Pupil n=93	$p \leq .000$	Df 92 (1, 1, 1, 89)
Teachers n=6	$p \leq .000$	Df 92 (5, 1, 5, 81)
Teachers n=7	$p \leq .000$	Df 102 (6, 1, 6, 89)

Details on pages H-4 to H-9

APPENDIX A

Sample PIT Descriptors

Personal Events

Pupil expressions of frustration and teacher responses.
Angry dialogue between two pupils concerning some action.
Teacher concern for pupil family matters.

Institutional Events (Playing School)

Roll call, announcements
Lining up for lunch.
Handing out materials; handing back papers.
Students pretending to work.

Task Events (Major Teaching/Learning Interactions)

Demonstration of how to read a map.
Student report to the class.
Teacher-pupil or pupil-pupil discussion on topic.
Teacher assisting individual pupil with independent study.

Galloway (1962) noted that a communication event can be defined as a sequence of teacher-pupil communicative behaviors separated from preceding and succeeding sequences of events (behaviors) by naturally occurring boundaries. Communication events are composed of both verbal and nonverbal behaviors by both teachers and pupils. It is not uncommon to find an entire event composed exclusively on nonverbal behaviors. It is also possible for a teacher to engage in two communication events simultaneously. Note a situation where a teacher asks a group a question about an assignment (Tg) and gestures to a single pupil to sop some "horseplay" (Ii).

*From French, R.L., & Galloway, C.M. (nd). Communication Events: A New Look at Classroom Interactions, pp. 2-5.

Observation of elementary and secondary classrooms suggests that what goes on there may be described as communication events that are institutional, task-oriented, personal, or mixed in nature.

Institutional Events

Institutional events relate to managing the classroom and meeting the expectations of the institution. Jackson (1968) delineated this kind of event by posing questions relevant to their recognition in most classrooms: (1) "Who may enter and leave the room?" (2) "How much noise is tolerable?" (3) "How to preserve privacy in a crowded setting?" (4) "What to do when work assignments are prematurely finished?" (5) "How far to go in establishing classroom-social etiquette?" The following illustrate institutional events:

1) A verbal and/or nonverbal reprimand to a student for chewing gum because this action is against school rules.

2) Teacher handing back quiz papers and explaining the grading procedures.

3) Teacher calling roll and pupils responding.

4) Pupils and teacher preparing to use a motion picture.

5) Teacher announcement and/or explanation of school events or activities.

6) Teacher calling for, signing, and discussing with pupils absence excuses.

7) Teacher cueing pupils verbally and/or nonverbally in an attempt to maintain silence or order and pupils responding.

8) Teacher directing pupils to begin their homework; pupils feigning industrious activity.

9) Teacher verbal and/or nonverbal directions to pupils in how to leave the classroom for some particular purpose.

Task Events

Task events focus on the teaching and learning of subject matter content whether cognitive, affective, or skill-oriented. Task events are characterized by stating, asking, showing, acknowledging, and clarifying communicative behaviors on the part of both teachers and pupils, and some key words related to these behaviors are suggestive of the work of Bloom (1956) and Sanders (1966): remembering, understanding, applying, analyzing, synthesizing, evaluating. Illustrative task events include:

1) A teacher-pupil discussion of the functions of Congress.
2) A teacher demonstration of how to read a weather map.
3) teacher explanation of the factors influencing the Battle of Gettysburg while pupils take notes.
4) Teacher aiding individual pupils during an independent study period.
5) A student report.
6) A laboratory exercise in which pupils are using microscopes with the teacher assisting them.

Personal Events

Personal events are those in which personal needs, goals, and emotions of a pupil, a group of pupils and/or the teacher provide the central focus. Davitz (1964) has provided a rather extensive list of emotional expressions relevant to these events. The list includes admiration, affection, amusement, anger, boredom, cheerfulness, despair, disgust, dislike, fear, impatience, joy, satisfaction, and surprise. Typical personal events are:

1) Pupil expressions of frustration and teacher response to these.
2) Teacher expression of personal interest in or concern for a pupil or his/her problems.

3) Pupil expression of affection toward the teacher and teacher response, either verbal or nonverbal.

4) Angry dialogue between two pupils concerning actions or the playground.

Mixed Events

Mixed events also occur in classrooms. These contain elements of more than one of the event types previously described. While one might classify mixed events according to the elements which they contain (task-personal events, institutional-personal events, etc.), this is a somewhat difficult and useless procedure. Interaction and communication become distorted when the focus of an event becomes complex and when participants are no longer aware of the specific nature of the event. Therefore, the category "mixed events" better describes those behavioral sequences than does any further breakdown of the category.

Coding Communication Events

Personal, institutional, task, or mixed events can involve the teacher with a single pupil or with a group of pupils. Since any attempt to identify the focus and intent of interaction in the classroom at any given time must include clarification of the number of participants involved, communication events must be classified as individual (interaction between the teacher and one pupils) or group (interaction between the teacher and several pupils).

A simple identification of classroom communication events involves a coding scheme utilizing the symbol (I) to signify institutional events, (P) for personal events, (T) for task events, and (M) for events which cannot be clearly defined (events mixed in nature). Further, institutional, task, or personal events involving the teacher with a single student (individual events) are indicated by the symbol i placed after the symbol characterizing the basic nature of the event (e.g., Ti, Pi, Ii).

APPENDIX B

Teacher _____ | PIT DATA FORM | Teacher _____ | SHEET CODE / DATE / TIME

	1	2	3	4		1	2	3	4	
Tg										Tg
Ti										Ti
Ig										Ig
Ii										Ii
Pg										Pg
Pi										Pi
M										M
TOT										TOT

g=group

PIT TALLY SHEETS

(Note) ID: Sheet/TCH	TASK Tg	TASK Ti	TASK TOT	INSTIT. Ig	INSTIT. Ii	INSTIT. TOT	PERSONNEL Pg	PERSONNEL Pi	PERSONNEL TOT	Mixed	Total

Code Sheet
Success Starts Small Study

X = "Experimental" or Study School
O = Control School
YR = Year-Around Calendar

PIT = Basic Observation Method (French & Galloway, nd)
P = Personal Events
I = Institutional Events ("Playing School")
T = Task Events
i = individual focus
g = group focus
M = Mixed Events
= = Pause or Break in Coding
O = A Circle around a PIT Event indicates that the action was done by someone other than the Teacher of the class (Aide, Supervisor, Volunteer)
(K), (1), etc. = Grade designation in ( )
Y = YES (for Coding Sheets)

EVENT/COMMUNICATION EVENT (French & Galloway, nd, p. 2)

A communication event . . . (is) sequence of teacher-pupil communicative behaviors separated from preceding and succeeding sequences of behaviors (events) by naturally occurring boundaries. As defined by Galloway (1962), these boundaries are: (1) a variation or change in the direction of the teacher's communicative behavior; (2) a change in the teacher's behavior toward a new interaction; (3) the occurrence of a significant or potent act which appears influential; and (4) social intervention in which an interruption is instigated by either a pupil or the teacher. As implied, communication events are composed of both verbal and nonverbal behaviors by both teachers and pupils. It is not uncommon to find an entire event composed entirely of nonverbal behaviors.

Coding Time = Approximately every 4-5 seconds and/or at a Change of Communication Event.

APPENDIX C
PROJECT SUCCESS – PROGRESS REPORT

Oak Hill Elementary School
March 17, 1993

Oak Hill Elementary is participating in "Project Success" in which the class size is based on 15 to 1 with no full time assistant and an agreement to teach using more hands on learning strategies and teach for higher level thinking.

Immediate observable benefits of class size of 15:

1. More individual attention

2. More personal space for each student

3. More personal teacher-student conversations

4. More time to diagnose how the students are thinking and to determine their understandings and misunderstandings

5. More time to diagnose and develop their most successful learning style

6. More time to get to know each student and their families – a message to parents that teacher really cares because she knows all about us

7. More time for students to get to know each other

8. More time for teacher to develop sense of community among classmates, connect her students with other big sister/big brother classes in the school

9. More students reading on more advanced levels.

10. More students understanding math concepts, not simply writing numbers and number facts

11. All students participating in "Seminars" discussing literature on their level, making concept connections and thinking about human values

12. More self confidence for learning regardless of abilities

13. Wider range of abilities able to learn together (fewer referrals out during these critical early years)

14. More time and space to develop hands on/student initiated learning rather than relying on mostly didactic, teacher controlled learning

15. More time to give "troubled kids" the attention they so desperately need, reducing greatly the likelihood of their becoming a discipline problem

16. More energy for collegial planning that led to well thought out, creative "webbing" thematic lessons

17. A sense of peacefulness in the class

Reading, mathematics and acceptable behaviors:

I asked the teachers quantitative questions about their students (n=50).

1. "How many of your students are reading?" 42 or 84% are reading (Of the 8 not reading, 3 are being assessed for EMH self-contained, 3 for LD and 2 seemed to be emerging as readers)

2. "How many of your students can do math?" 44 or 88%

3. "How many students were referred for severe discipline" 3 or 6%

4. "If you had a regular class size of 24 to 28 students, how many of your students might develop severe 'discipline problems'?" 19 or 38%

5. "If you had a regular class size of 24 to 28 students, how many of your students might be referred to special classes?" 8 or 16% (8 is the enrollment of many self-contained classes)

The teachers offered a series of anecdotes about their children

1. If I had 28 students as I did in my practice teaching, and had them all in rows, there is no way I could accommodate the learning of the 5 very low functioning children. As it is they will probably go to a self-contained classroom as second graders. But in the meantime, I can see they are learning, they see themselves as successful, vital persons in our class. Other students assist them in doing their work.

2. In this situation, not only did I know the students very well, they know each other very well. They know who can do what – who can help spell a work, who can read, who has been sick and with what. Quotes form students: I'll bet Heather can read that hard book. Dericas is sick. Do you know what is wrong with him? I dropped by Dericas and saw him and he really is sick. When Anthony came back after several days of sickness, they all cheered that he was back.

3. Some of my children who haven't started to read yet, want to read and do "pretend reading." Their classmates patiently and knowingly accept that and help them with their pretend reading. They move the marker or tell them the words.

4. The troubled children who need a lot of attention form me get that attention. With the 24 students I had in my practice teaching situation, I would not have had the time to give that attention, so the students would have begun to act out and would become discipline problems. I have the time and the relaxation to give the attention to the child who needs a minute or so more without worrying about losing the other children and the class as a whole.

5. I feel like I am being a successful teacher to all the students.

6. I feel that I really know where my children are in their learning because I can ask them how they figured something out. I can spend more focus on each of them diagnosing just how they learn.

7. With the 5 very low students, I have time to try the several ideas of the school base committee to help the students. With 24 students, I'd have time to try one or two and they might not work, so the child would be referred out of the big class probably.

8. I have enough unifix cubes for each student to work with 100 cubes when we studied the concept of 100.

APPENDIX D
Data Worksheets, SSS, 1993-94

Table D-1. Worksheet: Pre and Post Data (n) for Changes and Totals in School A.

Changes	T_l		T_g		Sub.T		T_l		T_g		Sub T		P_l		M		Total (n)	
Grades	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
K	56	32	29	27	85	59	14	13	26	8	40	21	5	3	0	0	130	83
1	55	45	40	59	95	104	44	35	28	35	72	70	7	3	1	0	175	177
2	37	24	39	41	76	65	56	20	25	11	81	31	3	1	3	0	163	97
Total	148	101	108	127	256	228	114	68	79	54	193	122	15	7	4	0	468	357

D-1

Totals	T_l		T_g		Sub.T		T_l		T_g		Sub T		P_l		M		Total (n)	
Grades	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
K	169	361	50	250	219	611	32	35	30	13	62	48	7	5	0	0	288	664
1	768	538	473	489	1241	1027	144	84	106	105	250	189	16	8	1	0	1508	1224
2	203	81	163	364	366	445	151	28	75	47	226	75	5	0	0	0	597	520
Total	1140	980	686	1103	1826	2083	327	147	211	165	538	312	28	13	1	0	2393	2408

Table D-2. Worksheet: Pre and Post Data (n) for Changes and Totals, School B.

Totals	T_1		T_g		Sub. T		T_1		T_g		Sub T		P_1		M		Total (n)	
Grades	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
K	139	–	90	–	229	–	57	–	40	–	97	–	1	–	0	–	327	–
1	205	298	325	301	530	599	53	139	87	142	140	281	2	7	0	1	672	888
2	239	–	101	–	340	–	54	–	109	–	163	–	4	–	0	–	507	–
Total	583	298	516	301	1099	599	164	139	236	142	400	281	7	7	0	1	1506	888

Changes	T_1		T_g		Sub. T		T_1		T_g		Sub T		P_1		M		Total (n)	
Grades	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
K	23	–	14	–	37	–	26	–	14	–	40	–	1	–	0	–	78	–
1	58	57	46	52	104	109	42	32	26	21	68	53	2	3	0	1	174	166
2	44	–	39	–	83	–	34	–	30	–	64	–	4	–	0	–	151	–
Total	125	57	99	52	224	109	102	32	70	21	172	53	7	3	0	1	403	166

D-2

Table D-3. Worksheet to Convert K and 2 Data to Numbers and Percents for Totals and Changes in Communications Events, Schools A and B.

		T_1		T_g		Sub. T		T_1		T_g		Sub T		P_1		M		Total (n)	
Totals		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
A	K	169	361	50	250	219	611	32	35	30	13	62	48	7	5	0	0	288	664
	2	203	81	163	364	366	445	151	28	75	47	226	75	5	0	0	0	597	520
TOT		372	442	213	614	585	1056	183	63	105	60	288	123	12	5	0	0	885	1184
% CAT		64	42	36	58	100	100	64	51	36	49	100	100						
% TOT		42	37	24	52	66	89	21	5	12	5	33	10	1	*	0	0	100	100
B	K	139	–	90	–	229	–	57	–	40	–	97	–	1	–	0	–	327	
	2	239	–	101	–	340	–	54	–	109	–	163	–	4	–	0	–	507	
TOT		378	–	191	–	569	–	111	–	149	–	260	–	5	–	0	–	834	
% CAT		66	–	34	–	100	–	43	–	57	–	100	–						
% TOT		45	–	23	–	68	–	13	–	18	–	31	–	1	–	0	–	100	
Changes																			
A	K	56	32	29	27	85	59	14	13	26	8	40	21	5	3	0	0	130	83
	2	37	24	39	41	76	65	56	20	25	11	81	31	3	1	3	0	163	97
TOT		93	56	68	68	161	124	70	33	51	19	121	52	8	4	3	0	293	180
% CAT		58	45	42	55	100	100	58	63	42	37	100	100						
% TOT		32	31	23	38	55	69	24	18	17	11	41	29	3	2	1	0	100	100
B	K	23	–	14	–	37	–	26	–	14	–	40	–	1	–	0	–	78	–
	2	44	–	39	–	83	–	34	–	30	–	64	–	4	–	0	–	151	–
TOT		67	–	53	–	120	–	60	–	44	–	104	–	5	–	0	–	229	–
% CAT		56	–	44	–	100	–	58	–	42	–	100	–						
% TOT		29	–	23	–	52	–	26	–	19	–	45	–	2	–	0	–	99*	–

*Totals may not equal 100 due to rounding.

Table D-4. Response, Using Last Four WEeks as Reference, of Number (n) Teacher/Parent Contact, or Volunteer or Aide Work in the Classroom. (Full questionnaire in Appendix C. Numbers are rounded.)

		SCHOOL A												
		Grade 1					Grade 2				Grade 3			
Items/Stem (4 weeks)		A	B	C	D	X	A	B	C	D	X	A	B	C	X
1.	Phone	7	5	3	8	5.8	27	20	3	6	14	3	0	6	4.5
2.	Written Note	20	3	20	11.5	63	25	8	16	28	4	4	6	4.7	
3.	School Conf.	0	0	0	1	3	12	6	1	2	5.3	1	0	1	.7
4.	Unsched. Contact	9	3	15	12	9.8	15	15	1	3	8.5	3	3	12	6
5.	Home Visit	3	0	0	1	1	0	0	0	0	0	0	0	1	3
6.	Form Letter	2	56	0	4	15.5	4	25	2	0	7.8	4	4	4	4
7.	Newsltr	1	2	2	4	2.3	4	4	1	8	4.3	4	4	4	4
8.	Parent Help	2	0	2	2	1.5	20	0	0	1	5.3	0	0	1	3
9.	Tot. Home	16	0	0	9	6.3	2	0	0	0	5	0	0	1	3
10.	Y,N	Y	Y	Y	N	Y	Y	N	N	N	N	Y	N	Y	Y
11.															
12.	Vist	2	0	2	0	1	20	20	0	0	10	0	0	2	.7
13.	Volunt.														
A.	Clerical	0	0	0	0	0	20	20	0	0	10	0	0	0	0
B.	Instr.	–	0	0	0	0	20	20	0	0	10	0	0	1	3
C.	Group Lesson	–	0	0	0	0	0	0	0	0	0	0	0	1	3
14.	Aide Help	20	–	5	0	6.3	20	20	20	20	20	20	20	20	20
15.	Aide do:														
A.	Pupil Supv.	20	40	20	20	25	20	20	20	20	20	20	20	20	20
B.	Clerical	20	20	7	10	14.3	20	20	5	20	16.3	20	20	20	20
C.	Instr.	0	0	0	0	0	10	15	12	3	10	20	20	20	20
16	Spec. Tch.17 (subj)	18	15	13	15.8	9	6	5	13	8.3	7	7	6	.7	
Aide? Full (F) Part (P)		P	P	P	P	P	P	P	P	P	P	F	F	F	F

Table D-4 continued

Items/Stem (4 weeks)	School B Grade 1			Burke County Grade 1 (One School)									
	A	B	X	A	B	C	D	E	F	G	H	I	X
1. Phone	12	10	11	2	0	1	2	0	3	0	1	3	2.8
2. Written Note	15	20	17.5	20	1	1	3	30	32	3	15+	16	13.4
3. School Conf.	6	0	3	0	0	0	0	1	4	1	15	2	2.6
4. Unsched. Contact	6	0	3	0	0	0	0	1	4	1	15	2	2.6
	5	5	5	5	8	4	5	5	10	2	15	3	6.3
5. Home Visit	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Form Letter	4	20	12	0	4	10	4	64	68	0	15	16	20.1
7. Newsltr	4	20	12	4	4	4	1	64	68	1	30	16	21.3
8. Parent Help	1	1	1	0	0	0	2	0	0	0	0	0	.2
9. Tot. Home	0	0	0	16	18	17	17	16	17	20	30	16	18.6
10. Y,N	N	Y	?	N	Y	Y	Y	Y	Y	N	Y	Y	Y
11.													
12. Vist	00	20	10	1	8	4	8	18	4	4	2	5	6
13. Volunt.													
A. Clerical	0	0	0	16	18	17	17	16	17	20	30	16	18.6
B. Instr.	–	20	10	1	8	4	8	18	4	4	2	5	6
C. Group Lesson	0	0	0	0	0	2	0	10	0	0	0	0	1.3
14. Aide Help	–	20	10	20	20	4	20	20	20	20	20	20	18.2
15. Aide do:													
A. Pupil Supr.	20	20	20	6	0	4	12	20	20	10	8	20	11.1
B. Clerical	20	20	20	20	0	0	0	0	3	10	8	4	5
C. Instr.	20	20	20	20	20	0	20	0	0	0	20	8	9.8
16 Spec. Tch. (subj)	12	12	12	24	12	4	4	12	13	12	24	20	13.9
Aide?	F	F	F	P	P	P	P	P	P	P	P	P	P

Full (F)
Part (P)

Table D-5. Responses to Teacher Grouping Questionnaire, Subject by Teacher by Grade Level: Grade K(A).

	Reading: Teachers			Math: Teachers			Science: Teachers			Soc Stu: Teachers		
Group Pupils For Instruct.?	A	B	C	A	B	C	A	B	C	A	B	C
Yes/No (Y/N)	N	N	N	N	N	N	N	N	N	N	N	N
# of Groups	1	1	1	1	1	1	1	1	1	1	1	1
Min/Wk	--	--	--	--	--	--	--	--	--	--	--	--
How Assign?												
A=Ability	--	--	--	--	--	--	--	--	--	--	--	--
I=Interest	--	--	--	--	--	--	--	--	--	--	--	--
O=Other	XX	--	--	XX	--	--	XX	--	--	XX	--	--
Freq. of Regrouping/Yr												
6 wks or so	--	--	--	--	--	--	--	--	--	--	--	--
at least twice	--	--	--	--	--	--	--	--	--	--	--	--
No	--	--	--	--	--	--	--	--	--	--	--	--
Pupil (n)*	13	10	12									

*Full-time teachers only, and no split grades.
V=Variable, xx: as needed/per tutors

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Table D-6. Responses to Teacher Grouping Questionnaire, Subject by Teacher by Grade Level: Grade 1(A)

	Reading: Teachers				Math: Teachers				Science: Teachers				Soc Stu: Teachers			
Group Pupils For Instruct.?	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Yes/No (Y/N)	Y	Y	Y	Y	Y	N	N	Y	N	N	N	Y	N	N	N	N
# of Groups	5	3	3	V	5	--	--	7	--	--	--	7	--	--	--	--
Min/Wk	150	30	150	50	150	--	--	50	--	--	--	40	--	--	--	--
How Assign?																
A=Ability	--	A	A	A	--	--	--	A	--	--	--	--	--	--	--	--
I=Interest	--	--	I	I	--	--	--	A	--	--	--	--	--	--	--	--
O=Other	XX	XX	XX	XX	XX	--	--	XX	--	--	--	--	--	--	--	--
Freq. of Regrouping/Yr																
6 wks or so	Daily	V	V	X	Daily	V	--	X	--	--	--	--	--	--	--	--
at least twice	--	--			--	--	--	--	--	--	--	--	--	--	--	--
No	--	--			--	--	--	--	--	--	--	--	--	--	--	--
Pupils (n)	15	14	16	15												

V=Variable, xx. Mixed groups by skills, but group works well together/peer interactional partners.

Table D-7. Responses to Teacher Grouping Questionnaire, Subject by Teacher by Grade Level: Grade 2(A)

	Reading: Teachers				Math: Teachers				Science: Teachers				Soc Stu: Teachers			
Group Pupils For Instruct.?	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Yes/No (Y/N)N	N	N	Y	Y	N	N	Y	N	N	N	N	N	N	N	N	N
# of Groups	1	1	3	6	1	1	4	1	1	1	1	1	1	1	1	1
Min/Wk	--	--	30	150	--	--	180	--	--	--	--	--	--	--	--	--
How Assign?																
A=Ability	--	--	A	A	A	--	A	--	--	--	--	--	--	--	--	--
I=Interest	A	--	I	I	--	--	--	--	--	--	--	--	--	--	--	--
O=Other	XX	--	XX	XX	XX	--	XX	--	--	--	--	--	--	--	--	--
Freq. of Regrouping/Yr																
6 wks or so	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
at least twice	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
No	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pupils (n)	18	15	18	19												

*Full-time teachers only, and no split grades.
V=Variable, xx: Cooperative learning models/random/partners.

Table D-8. Responses to Teacher Grouping Questionnaire, Subject by Teacher by Grade Level: Grade 2(A)

	Reading: Teachers		Math; Teachers		Science: Teachers		Social Studies: Teachers	
Group Pupils For Instruct.?	A	B	A	B	A	B	A	B
Yes/No (Y/N)	Y	Y	N/Y	N	N	N	N	N
# of Groups	3-4	V	(some)	1	1	1	1	1
Min/Wk	150	300	V	--	--	--	--	--
How Assign?								
A=Ability	A	A	A		--	--	--	--
I=Interest	I	--	I	I	--	--	--	--
O=Other	--	--	--	Team	--	--	--	--
Freq. of Regrouping/Yr								
6 wks or so	X	X	X	X	--	--	--	--
at least twice	--	--	--	--	--	--	--	--
No	--	--	--	--	--	--	--	--
Pupils (n)	23	23						

*Full-time teachers only, and no split grades.
V=Variable, depending on situation; Team = based on teamwork ability.

Table D-9. Responses to Teacher Grouping Questionnaire, Subject by Teacher by Grade Level: Grade 1 (Burke Co.)

	Reading: Teachers				Math: Teachers				Science: Teachers				Soc Stu: Teachers			
Group Pupils For Instruct.?	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Yes/No (Y/N)	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N
# of Groups	6	3	2	5	4	X	2	2	6	1	1	1	1	1	1	1
Min/Wk	40	60	300	150	40	XX	150	30	40	--	--	--	--	--	--	--
How Assign?																
A=Ability	A	A	A	A	A	--	A	A	--	--	--	--	--	--	--	--
I=Interest	I	I	I	I	I	--	--	--	--	--	--	--	--	--	--	--
O=Other	--	--	--	R	--	X	--	--	--	--	--	--	--	--	--	--
Freq. of Regrouping/Yr																
6 wks or so	X	--	X	X	X	--	X	--								
at least twice	--	X	--	--	--	X	--	X								
No	--	--	--	--	--	--	--	--								
Pupils (n)	16	16	16	16												

*Full-time teachers only, and no split grades.
V=Variable, xx: as needed/peer tutors/cooperative learning; R=Random.

Table D-10. Responses to Teacher Grouping Questionnaire, Subject by Teacher by Grade Level: Grade 1 (Burke Co.)

Group Pupils	Reading: Teachers					Math: Teachers					Science: Teachers					Soc Stu: Teachers				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
For Instruct.?																				
Yes/No (Y/N)	Y	Y	N	N	Y	Y	Y	N	N	Y	N	N	N	N	Y	N	N	N	N	Y
# of Groups	V	V	1	1	V	V	V	1	1	V	1	1	1	1	V	1	1	1	1	V
Min/Wk	V	V	--	XX	V	V	V	--	XX	V	--	--	--	XX	V	--	--	--	XX	V
How Assign?																				
A=Ability	A	A	--	--	A	A	A	--	--	A	--	--	--	--	A	--	--	--	--	A
I=Interest	I	I	--	--	I	I	I	--	--	--	--	--	--	--	--	--	--	--	--	--
O=Other	XX	XX	--	--	XX	XX	XX	--	XX	XX	--	--	--	XX	XX	--	--	--	XX	XX
Freq. of Regrouping/Yr																				
6 wks or so	--	--	--	V	--	--	X	--	V	--	--	--	--	V	--	--	--	--	X	--
at least twice	X	X	-	-	X	X	--	--	--	X	--	--	--	X	X	--	--	--	X	X
No	--	--	--	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	X	--
Pupils (n)	16	17	15	15	16															

*Full-time teachers only, and no split grades.
V=Variable, xx: as needed/peer tutors/cooperative learning; R=Random.

One Factor ANOVA ANLAYSIS

School v. Pre SS

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	70162.684	70162.684	8.89
Within groups	101	797250.772	7893.572	p = .0036
Total	102	867413.456		

Model I estimate of between component variance = 1218.412

Group:	Count:	Mean:	Std. Dev.:	Std. Error
Sch#1	56	305.64	90.68	12.118
Sch#2	47	358.04	86.60	12.632

Comparison:	Mean Diff.:	Fisher PLSD:	Scheffe F-test:	Dunnett t:
Sch#1 vs. Sch#2	-52.4	34.869 *	8.889 *	2.981

* Significant at 95%

School v. Post SS

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	43181.66	43181.66	4.24
Within groups	101	1029691.90	10194.97	p = .0422
Total	102	1072873.55		

Model II estimate of between component variance = 645.446

Group:	Count:	Mean:	Std. Dev.:	Std. Error
Sch#1	56	407.79	101.59	13.58
Sch#2	47	448.89	100.22	14.62

Comparison:	Mean Diff.:	Fisher PLSD:	Scheffe F-test:	Dunnett t:
Sch#1 vs. Sch#2	-41.108	39.627 *	4.236 *	2.058

* Significant at 95%

Teacher v. Pre SS

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	6	127183.778	21197.296	2.75
Within groups	96	740229.679	7710.726	p = .0165
Total	102	867413.456		

Model II estimate of between component variance = 922.797

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
T. A1	14	304.36	75.11	20.08
T. A2	12	343.58	92.56	26.72
T. A3	16	266.13	65.67	16.42
T. A4	14	319.57	116.03	31.01
T. B1	10	388.70	49.75	15.73
T. B2	18	348.22	95.58	22.53
T. B3	19	351.21	92.91	21.32

Comparison:	Mean Diff.:	Fisher PLSD:	Scheffe F-test:	Dunnett t:
T. A1 vs. T. A2	-39.23	68.58	0.22	1.14
T. A1 vs. T. A3	38.23	63.80	0.24	1.19
T. A1 vs. T. A4	-15.21	65.89	0.04	0.46
T. A1 vs. T. B1	-84.34	72.175 *	0.90	2.32
T. A1 vs. T. B2	-43.87	62.12	0.33	1.40
T. A1 vs. T. B3	-46.85	61.40	0.38	1.52
T. A2 vs. T. A3	77.46	66.57 *	0.89	2.31
T. A2 vs. T. A4	24.01	68.58	0.08	0.70
T. A2 vs. T. B1	-45.12	74.64	0.24	1.20
T. A2 vs. T. B2	-4.64	64.97	0.00	0.14
T. A2 vs. T. B3	-7.63	64.28	0.01	0.24
T. A3 vs. T. A4	-53.45	63.80	0.46	1.66
T. A3 vs. T. B1	-122.58	70.271 *	2.00	3.46
T. A3 vs. T. B2	-82.10	59.895 *	1.23	2.72
T. A3 vs. T. B3	-85.09	59.149 *	1.36	2.86
T. A4 vs. T. B1	-69.13	72.18	0.60	1.90
T. A4 vs. T. B2	-28.65	62.12	0.14	0.92
T. A4 vs. T. B3	-31.64	61.40	0.17	1.02
T. B1 vs. T. B2	40.48	68.75	0.23	1.17
T. B1 vs. T. B3	37.49	68.10	0.20	1.09
T. B2 vs. T. B3	-2.99	57.34	0.00	0.10

* Significant at 95%

Teacher v. Post SS

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	6	100900.423	16816.737	1.66
Within groups	96	971973.13	10124.72	p = .139
Total	102	1072873.553		

Model II estimate of between component variance = 457.89

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
T. A1	14	420.21	80.70	21.57
T. A2	12	435.58	100.14	28.91
T. A3	16	373.44	103.84	25.96
T. A4	14	410.79	117.85	31.50
T. B1	10	470.80	54.69	17.29
T. B2	18	418.39	114.39	26.96
T. B3	19	466.26	101.49	23.28

Comparison:	Mean Diff.:	Fisher PLSD:	Scheffe F-test:	Dunnett t:
T. A1 vs. T. A2	-15.37	78.58	0.03	0.39
T. A1 vs. T. A3	46.78	73.10	0.27	1.27
T. A1 vs. T. A4	9.43	75.50	0.01	0.25
T. A1 vs. T. B1	-50.59	82.71	0.25	1.21
T. A1 vs. T. B2	1.83	71.18	0.00	0.05
T. A1 vs. T. B3	-46.05	70.36	0.28	1.30
T. A2 vs. T. A3	62.15	76.28	0.44	1.62
T. A2 vs. T. A4	24.80	78.58	0.07	0.63
T. A2 vs. T. B1	-35.22	85.53	0.11	0.82
T. A2 vs. T. B2	17.19	74.44	0.04	0.46
T. A2 vs. T. B3	-30.68	73.66	0.11	0.83
T. A3 vs. T. A4	-37.35	73.10	0.17	1.01
T. A3 vs. T. B1	-97.36	80.52	0.96	2.40
T. A3 vs. T. B2	-44.95	68.63	0.28	1.30
T. A3 vs. T. B3	-92.83	67.78	1.23	2.72
T. A4 vs. T. B1	-60.01	82.71	0.35	1.44
T. A4 vs. T. B2	-7.60	71.18	0.01	0.21
T. A4 vs. T. B3	-55.48	70.36	0.41	1.57
T. B1 vs. T. B2	52.41	78.78	0.29	1.32
T. B1 vs. T. B3	4.54	78.04	0.00	0.12
T. B2 vs. T. B3	-47.87	65.70	0.35	1.45

Type III Sums of Squares

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
School	1	192.994	192.994	.043	.8354
Pre SS	1	574333.128	574333.128	129.136	.0001
School * Pre SS	1	383.510	383.510	.086	.7696
Residual	99	440302.649	4447.502		

Dependent: Post SS

Means Table
Effect: School
Dependent: Post SS

	Count	Mean	Std. Dev.	Std. Error
Sch#1	56	407.786	101.594	13.576
Sch#2	47	448.894	100.219	14.618

Scheffe's S
Effect: School
Dependent: Post SS
Significance level: .05

	Vs.	Diff.	Crit. diff.	P-Value	
Sch#1	Sch#2	41.108	26.177	.0024	S

S = Significantly different at this level.

Model Summary
Dependent: Post SS

Count	103
R	.768
R-Squared	.590
Adj. R-Squared	.577
RMS Residual	66.690

	df	Sum of Squares	Mean Square	F-Value	P-Value
Model	3	632570.905	210856.968	47.410	.0001
Error	99	440302.649	4447.502		
Total	102	1072873.553			

Model Coefficient Table
Dependent: Post SS

		Beta	Std. Error	t-Test	P-Value
Intercept		150.136	41.801	3.592	.0005
School	Sch#1	-10.915	52.397	-.208	.8354
	Sch#2	0.000	.	.	.
Pre SS		.834	.114	7.349	.0001
School * Pre SS	Sch#1, Pre SS	.044	.151	.294	.7696
	Sch#2, Pre SS	0.000	.	.	.

Residual Summary
Dependent: Post SS

SS[e(i)-e(i-1)]	891024.013
number >= 0	53
number < 0	50
Durbin-Watson	2.024
Serial Autocorrelation	-.013

E-5

Type III Sums of Squares

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
School	1	7.885	7.885	.002	.9674
Pre SS	1	558126.060	558126.060	119.245	.0001
School * Pre SS	1	51.186	51.186	.011	.9169
Residual	89	416564.483	4680.500		

Dependent: Post SS

Means Table
Effect: School
Dependent: Post SS

	Count	Mean	Std. Dev.	Std. Error
Sch#1	56	407.786	101.594	13.576
Sch#2	37	442.973	109.165	17.947

Model Summary
Dependent: Post SS

Count	93
R	.770
R-Squared	.593
Adj. R-Squared	.580
RMS Residual	68.414

	df	Sum of Squares	Mean Square	F-Value	P-Value
Model	3	607701.216	202567.072	43.279	.0001
Error	89	416564.483	4680.500		
Total	92	1024265.699			

Model Coefficient Table
Dependent: Post SS

		Beta	Std. Error	t-Test	P-Value
Intercept		141.477	44.373	3.188	.0020
School	Sch#1	-2.255	54.948	-.041	.9674
	Sch#2	0.000	•	•	•
Pre SS		.862	.123	7.024	.0001
School * Pre SS	Sch#1, Pre SS	.017	.159	.105	.9169
	Sch#2, Pre SS	0.000	•	•	•

Residual Summary
Dependent: Post SS

SS(e(i)-e(i-1))	838228.836
number >= 0	48
number < 0	45
Durbin-Watson	2.012
Serial Autocorrelation	-.008

E-6

Type III Sums of Squares

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Teacher+	6	22856.625	3809.438	.849	.5357
Pre SS	1	334960.450	334960.450	74.654	.0001
Teacher+ * Pr...	6	18138.082	3023.014	.674	.6711
Residual	89	399326.365	4486.813		

Dependent: Post SS

Means Table
Effect: Teacher+
Dependent: Post SS

	Count	Mean	Std. Dev.	Std. Error
T. A1	14	420.214	80.698	21.567
T. A2	12	435.583	100.137	28.907
T. A3	16	373.438	103.836	25.959
T. A4	14	410.786	117.848	31.496
T. B1	10	470.800	54.687	17.293
T. B2	18	418.389	114.386	26.961
T. B3	19	466.263	101.487	23.283

BY TEACHER ANCOVA (n-7)

E-7

Scheffe's S
Effect: Teacher+
Dependent: Post SS
Significance level: .05

	Vs.	Diff.	Crit. diff.	P-Value	
T. A3	T. A4	37.348	89.107	.8857	
	T. B2	44.951	83.660	.7013	
	T. A1	46.777	89.107	.7242	
	T. A2	62.146	92.983	.4412	
	T. B3	92.826	82.618	.0159	S
	T. B1	97.362	98.153	.0536	
T. A4	T. B2	7.603	86.766	1.0000	
	T. A1	9.429	92.030	.9999	
	T. A2	24.798	95.787	.9891	
	T. B3	55.477	85.762	.4835	
	T. B1	60.014	100.813	.5874	
T. B2	T. A1	1.825	86.766	1.0000	
	T. A2	17.194	90.742	.9980	
	T. B3	47.874	80.087	.5825	
	T. B1	52.411	96.033	.6852	
T. A1	T. A2	15.369	95.787	.9992	
	T. B3	46.049	85.762	.7019	
	T. B1	50.586	100.813	.7653	
T. A2	T. B3	30.680	89.782	.9551	
	T. B1	35.217	104.255	.9576	
T. B3	T. B1	4.537	95.126	1.0000	

S = Significantly different at this level.

Model Summary
Dependent: Post SS

Count	103
R	.792
R-Squared	.628
Adj. R-Squared	.573
RMS Residual	66.984

	df	Sum of Squares	Mean Square	F-Value	P-Value
Model	13	673547.188	51811.322	11.547	.0001
Error	89	399326.365	4486.813		
Total	102	1072873.553			

E-8
By Teacher (n=7)

Model Coefficient Table
Dependent: Post SS

		Beta	Std. Error	t-Test	P-Value
Intercept		196.047	61.627	3.181	.0020
Teacher+	T. A1	24.449	98.920	.247	.8054
	T. A2	-62.944	98.958	-.636	.5264
	T. A3	-155.903	94.817	-1.644	.1037
	T. A4	-60.202	82.077	-.733	.4652
	T. B1	75.092	186.221	.403	.6877
	T. B2	-107.303	86.895	-1.235	.2201
	T. B3	0.000	•	•	•
Pre SS		.769	.170	4.528	.0001
Teacher+ * Pre SS	T. A1, Pre SS	-.113	.300	-.377	.7069
	T. A2, Pre SS	.111	.277	.401	.6892
	T. A3, Pre SS	.483	.313	1.541	.1268
	T. A4, Pre SS	.091	.233	.390	.6978
	T. B1, Pre SS	-.256	.480	-.533	.5954
	T. B2, Pre SS	.177	.240	.738	.4627
	T. B3, Pre SS	0.000	•	•	•

Residual Summary
Dependent: Post SS

SS[e(i)-e(i-1)]	892497.918
number >= 0	55
number < 0	48
Durbin-Watson	2.235
Serial Autocorrelation	-.120

E-9
By Teacher (n=7)

Type III Sums of Squares

Source	df	Sum of Squares	Mean Square	F-Value	P-Value
Teacher+	5	20217.293	4043.459	.866	.5078
Pre SS	1	493829.698	493829.698	105.740	.0001
Teacher+ * Pr...	5	15294.850	3058.970	.655	.6585
Residual	81	378288.298	4670.226		

Dependent: Post SS

Means Table
Effect: Teacher+
Dependent: Post SS

	Count	Mean	Std. Dev.	Std. Error
T. A1	14	420.214	80.698	21.567
T. A2	12	435.583	100.137	28.907
T. A3	16	373.438	103.836	25.959
T. A4	14	410.786	117.848	31.496
T. B2	18	418.389	114.386	26.961
T. B3	19	466.263	101.487	23.283

Model Summary
Dependent: Post SS

Count	93
R	.794
R-Squared	.631
Adj. R-Squared	.581
RMS Residual	68.339

	df	Sum of Squares	Mean Square	F-Value	P-Value
Model	11	645977.400	58725.218	12.574	.0001
Error	81	378288.298	4670.226		
Total	92	1024265.699			

E-10

By TEACHER ANCOVA (n=6)

Model Coefficient Table
Dependent: Post SS

		Beta	Std. Error	t-Test	P-Value
Intercept		196.047	62.874	3.118	.0025
Teacher+	T. A1	24.449	100.921	.242	.8092
	T. A2	-62.944	100:961	-.623	.5347
	T. A3	-155.903	96.735	-1.612	.1109
	T. A4	-60.202	83.738	-.719	.4743
	T. B2	-107.303	88.653	-1.210	.2297
	T. B3	0.000	•	•	•
Pre SS		.769	.173	4.438	.0001
Teacher+ * Pre SS	T. A1, Pre SS	-.113	.306	-.370	.7126
	T. A2, Pre SS	.111	.282	.393	.6951
	T. A3, Pre SS	.483	.320	1.511	.1348
	T. A4, Pre SS	.091	.238	.382	.7036
	T. B2, Pre SS	.177	.245	.723	.4718
	T. B3, Pre SS	0.000	•	•	•

Residual Summary
Dependent: Post SS

SS[e(i)-e(i-1)]	835543.042
number >= 0	49
number < 0	44
Durbin-Watson	2.209
Serial Autocorrelation	-.107

E-11
By Teacher ANCOVA (n=6)